STAIR PARTS · CURVED & VOLUTE RUNS

Bending *Handrail*
Installation Guide

Code-compliant install for the pre-engineered (kerfed) bending rail UWP supplies through the Tanner Rd yard — radius rules, template method, glue-up timing, sub-rail option, joining curves to straight runs, and the shop-laminated upgrade path when site-bending will not take the curve.

WHEN THE RAIL HAS TO TURN

The kerfed rail *does the bending.*

Pre-engineered bending handrail is a standard hardwood handrail profile with a series of vertical kerfs cut into the underside. The kerfs let the rail flex around a curve where a solid rail would crack or refuse to bend. Glue closes the kerfs when the rail is clamped into its final shape; once cured, the rail behaves like a solid section. This guide covers the field install — layout, template, dry-fit, glue-up, and finish — for the bending rails UWP stocks at Tanner Rd.

WHAT THIS GUIDE COVERS

- Pre-engineered (kerfed) bending rail UWP supplies (special order) — UW-6010B / UW-N6210B / UW-6710B / UW-6003B and the WO white-oak variants.
- Continuous-radius curved stair handrails (the rake of a curved stair) and landing-turn / volute / starter-step curves.
- The three radius tiers — easy (R > 60"), medium (24"–60"), and tight (R < 24") — and which method works where.
- Template method — story-stick layout, transfer to the curve, dry-fit verification.
- Sub-rail option for tight or compound curves where a single bending rail will not take the radius.
- Joining curved sections to straight runs with a rail-bolt transition.
- IRC R311.7.8 height + graspability applied to the curve (no exemption — code is the same).
- Troubleshooting — kink, spring-back, glue squeeze, joint mismatch.

WHAT THIS GUIDE DOES NOT COVER

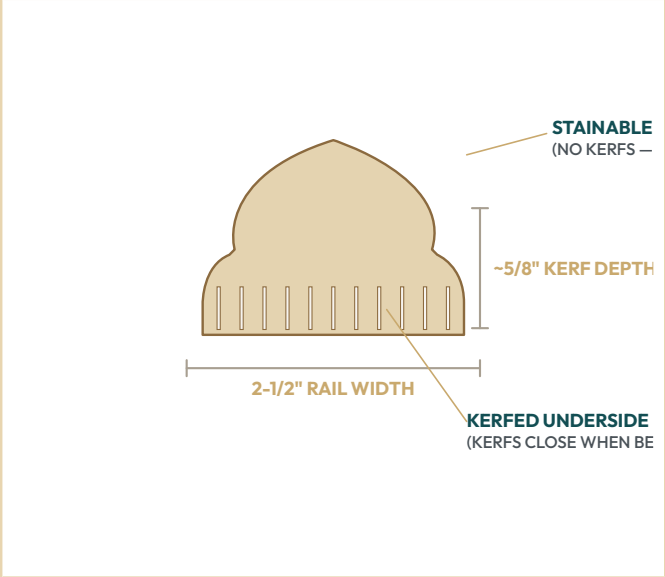
- Steam-bending solid handrail — a shop process, not a field install. UWP's shop runs it when called for.
- Helical (3D-curving) handrails — own appendix; significantly more complex than a 2D arc.
- Over-the-post fittings for curved runs — volutes, easings, turnouts riding over pin-top newels. Different layout entirely.
- Straight-stair post-to-post install — see the UWP Handrail & Newel Installation Guide.
- Iron handrail curves — UWP does not stock or fabricate these.
- Cable / rod railing curves — UWP does not carry these systems by program choice.

THE UPGRADE PATH

Where the radius is too tight, the curve too compound, or the species too brittle for site-bending, UWP's shop laminates the curve to template — multiple thin plies glued and clamped to a curved form, delivered as a finished arc. Installer mounts the finished curve. Quoted off field measurements; lead time 2–4 weeks.

A HANDRAIL THAT TAKES A CURVE

The kerf is *the mechanism.*



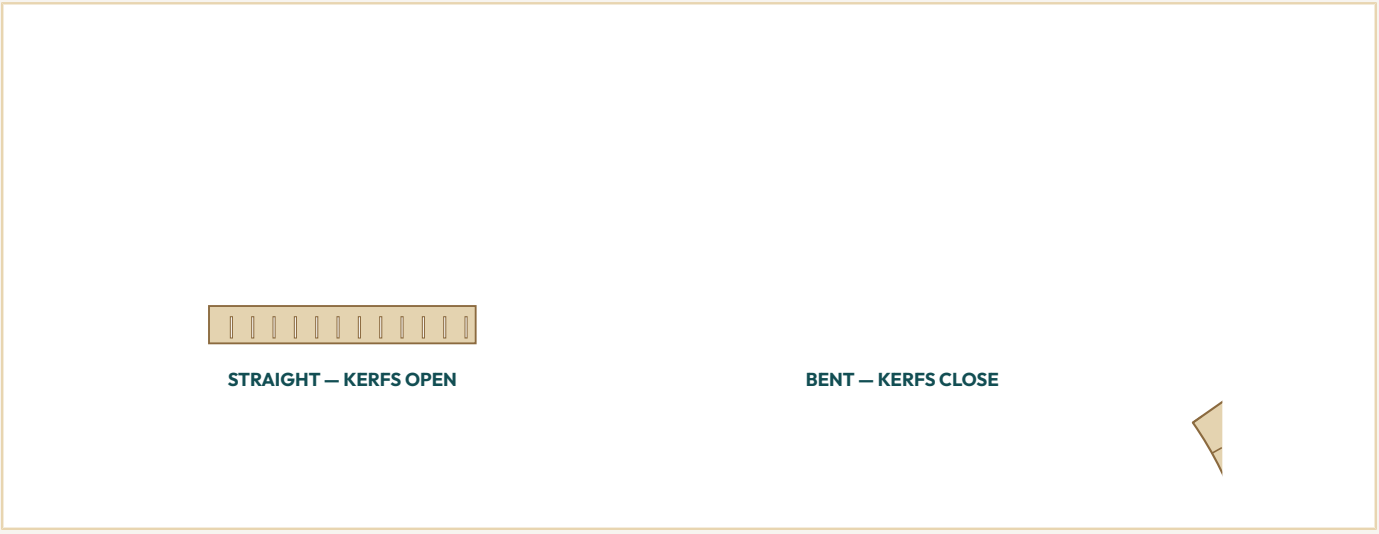
BENDING RAIL · CROSS-SECTION SHOWING KERF PATTERN

HOW A KERFED RAIL BENDS

The kerfs are vertical saw cuts into the rail underside — typically ~5/8" deep, ~1/16" wide, spaced ~1/4" on center. The top of the rail (the face that shows) is left intact and unkerfed.

When you bend the rail into a concave curve (kerfs facing in), the kerfs close. Glue applied to the kerf faces wedges into the closing gap. Once cured, the kerfs become invisible glue joints and the rail behaves as a continuous solid.

The top face never opens — that's why the visible rail surface stays clean. The trick is keeping the kerfs uniformly closed during clamp-up.



KERFS OPEN WHEN STRAIGHT · CLOSE WHEN BENT INWARD

DIRECTION MATTERS

Bending rail bends in one direction — kerfs in, top out. Reverse the rail and the kerfs open instead of closing; the rail will not bend and may crack. Always orient kerfs toward the concave (inside) side of the curve before any layout cuts.

WHAT UWP OFFERS

The bending rail *program.*

UWP offers the bending versions of the same profile families as the straight handrails — 6010, N6210, 6710, and 6003. Same profile family means a curved-to-straight transition is clean: the cross-sections align within thousandths and the joint disappears under finish. Bending rail is special order; species, BSP / BM variants and timing are confirmed at quote.

STANDARD BENDING RAILS

UW-6010B	6010 bending rail (red oak)	Most common
UW-WO6010B	6010 bending rail (white oak)	WO species
UW-N6210B	Narrow 6210 bending rail (RO)	Tighter grip
UW-WON6210B	Narrow 6210 bending rail (WO)	WO species
UW-6710B	6710 bending rail	Larger profile
UW-6003B	6003 bending rail	Small profile
UW-WO6003B	6003 bending rail (WO)	WO species

VARIANTS — BSP / BM

BSP suffix = special prep (additional kerfing for tighter radii). BM suffix = bend matched (kerf-pattern matched to a specified radius — special order, lead time applies).

SUB-RAILS & COMPANION STOCK

UW-6007	Sub-rail (6007)	Most common
UW-WO6007	Sub-rail (WO)	WO species
UW-6007A	Sub-rail — alt profile	Variant
UW-6045	Plowed sub-rail	Square balusters
UW-6050	Sub-rail — deep profile	Tight radii
UW-6000F	Finger-jointed sub-rail	Paint grade
UW-6001SP3	Special-prep sub-rail	Pre-kerfed
UW-6001FP3	FJ special-prep sub-rail	Paint, pre-kerf

STANDARD LENGTHS

Bending rails come in 6', 8', 10', and 12' lengths. For a curved-stair run, order one length longer than the developed arc length — bending consumes ~3–5% in kerf closure.

PROFILE FAMILY RULE (SAME AS STRAIGHT RAILS)

On a stair with both curved and straight sections, stay in one profile family — 6010 + 6010B, or N6210 + N6210B. Mixing 6010 with 6210 telegraphs at every transition. Order the straight and the bending rail in the same species, ideally from the same shipment, for grain-match.

HOW TIGHT IS THE CURVE?

Pick the method *by radius.*

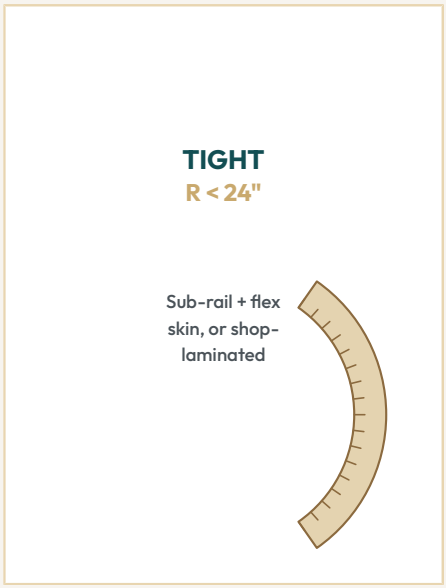
The single decision that drives the whole install is the radius. Measure (or estimate from the plan) the inside radius of the curve at handrail height. The radius determines whether a single bending rail handles it, whether you need a sub-rail underneath, or whether the curve calls for a shop-laminated section.



TIER 1 · EASY (R > 60")



TIER 2 · MEDIUM (24"–60")



TIER 3 · TIGHT (R < 24")

TIER 1 — EASY

Most landing-turn curves and large continuous-radius curved stairs land here. A single UW-6010B bending rail dry-fits to the curve without strain. Standard kerf pattern is plenty. One installer can clamp; cure 24 hr.

TIER 2 — MEDIUM

Volutes, tighter landing turns, and most short curved-stair runs. Bending rail will take it but spring-back is real. Install a sub-rail (UW-6007) on the curve first to take the structural load; lay the bending rail over it. Two installers; cure 24 hr.

TIER 3 — TIGHT

Tight starter volutes, helical sections, compound curves. Site-bending a single rail risks fracture. Sub-rail + flex skin method (page 10) or order the curve laminated from UWP's shop. Below R = 12", site-bending is not a method — shop only.

SET UP THE CURVE BEFORE YOU CUT THE RAIL

Tools & *materials.*

LAYOUT & TEMPLATING

- Story stick — straight 1x scrap longer than the developed arc length
- Trammel arm + pencil — for stepping off the radius if drawing the curve from scratch
- Long flexible curve gauge or 6-ft contour gauge (a long PVC strip works)
- Spring tape + folding rule for in-place arc measurement
- Sharp pencil; carpenter's crayon for rougher marks

CUTTING & SHAPING

- Compound miter saw — clean transition cuts to straight sections
- Fine-tooth handsaw or Japanese pull saw — for trim cuts on the bench
- Sharp 3/4" chisel for trimming kerf strips after cure
- Block plane + sanding sponge (120, 180, 220) for joint and curve refinement

CLAMPING

- Long-throat bar clamps OR pipe clamps — minimum 12 around the curve length
- Cauls — shop-made wood strips, 1/2" plywood the rail width — protect rail face from clamp jaws
- Strap clamps (1") for landing turns and volutes
- Spring clamps for small detail work

ADHESIVES

- Slow-set wood glue — minimum 30-minute open time (Titebond Extend, Original is too fast)
- Polyurethane glue (Gorilla Glue or equivalent) — moisture-cured, gap-filling, longer working time
- Epoxy (slow hardener) — for tight-radius / structural critical joints
- Construction adhesive — only for sub-rail to substrate; not for the bending rail itself

GLUE STRATEGY

Slow-set PVA (Titebond Extend) is the workhorse for Tier-1 and Tier-2 radii. Get more open time so you can fully position and clamp before set. PU is the choice for tight radii where you need foam-fill in the closing kerfs. Epoxy when the curve is structural and you cannot afford a re-do.

SUB-RAIL & FASTENERS

- UW-6007 sub-rail (most common), or UW-6045 if balusters are square + plowed
- 1-1/4" finish screws — sub-rail to structure (every 8")
- Rail-bolt kit — for curved-to-straight rail transition (UW-6010B 'UW-6010)
- Color-matched wood plugs (per species)
- Pin nails (23 ga) for clamp-time positioning, not structural

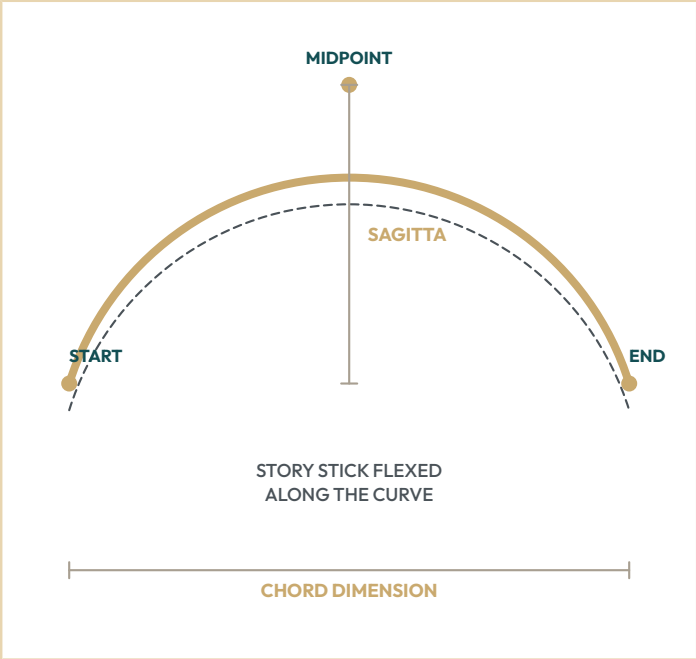
GLUE WORKING TIME — NON-NEGOTIABLE

> Bending rail glue-up has more open joints, more clamp positions, and more rail length to manage than any straight install. Use a minimum 30-minute open-time glue. Standard Titebond Original (10 min) will set before you finish clamping a Tier-2 curve — and a partially-set glue line is unfixable without a recut.

FIELD-MEASURE BEFORE YOU CUT

Build the *template first.*

Architectural drawings rarely match the as-built curve. Before cutting a single inch of bending rail, capture the real curve with a story stick. A flexible strip of stock laid along the actual installed sub-stair or landing curve gives you the developed arc length plus the chord-and-sagitta geometry — the two numbers that tell you exactly how much rail to cut and what radius you're actually bending to.



STORY STICK + CHORD/SAGITTA — CAPTURES THE REAL CURVE

COMPUTING RADIUS FROM CHORD + SAGITTA

When you can't measure the radius directly, use the chord (straight-line distance) and sagitta (height of the arc above the chord at midpoint).

$$R = (c^2 \div 8s) + (s \div 2)$$

where c is the chord and s is the sagitta. Example: 48" chord, 6" sagitta 'R = (2304 ÷ 48) + 3 = 51". Tier 2 — sub-rail recommended.

1 *Lay the story stick.*

Use a flexible 1/4"–1/2" strip of stock longer than the developed arc length. Bend it gently into the curve at handrail height (typically 36-1/2" plumb above the nosing or landing). Pin it temporarily with brad nails or tape.

2 *Mark the endpoints + midpoint.*

Mark on the story stick exactly where the curve begins (transition from straight) and where it ends. Mark the midpoint. These three reference points carry through to the rail layout.

3 *Capture chord + sagitta.*

Pull the story stick off the curve and lay it flat. Measure the straight-line distance from start to end (chord). Re-bend to the curve and measure the height from the chord to the midpoint (sagitta). Record both. These are the curve fingerprint.

4

Compute radius, transfer to rail.

Use the formula above to compute the effective radius. Cross-reference to the radius tier (page 5) to confirm the method. Then mark the bending rail at the same start/midpoint/end positions you marked on the story stick — these become the dry-fit reference points.

NEVER GLUE WITHOUT DRY-FITTING FIRST

Dry-fit *first.*

Bending rail glue-up has no second chance. Once glue is open and the rail is clamped to the curve, any mismatch in length, alignment, or rail-bolt position has to be lived with. Dry-fit confirms the rail takes the bend cleanly, lands on the marks, and joins to straight sections at the right plumb cut — all before glue touches a surface.

1

Bend the rail dry to the curve.

With the sub-rail in place (Tier 2 or 3) or against the curved framework (Tier 1), bend the bending rail by hand to follow the curve. The rail should follow the radius without forcing — your hand pressure should bend it the last quarter of the way, not muscle the whole bend. If the rail resists strongly at any point, the radius is tighter than the rail can take. Stop; reconsider method.

2

Verify reference marks.

With the rail bent in place, check that the start, midpoint, and end marks on the rail land on the corresponding marks on the curve. Off by more than 1/4"? The rail length is wrong or the curve length is. Re-measure the story stick, recut if needed. Off by less than 1/4"? Adjust by trimming one end — bending shortens the rail by ~3–5% in kerf closure.

3

Test clamp positions.

Set every clamp dry — pipe clamps spaced ~6"–8" around the curve length, cauls between the clamp jaw and the rail to spread pressure. Light pressure only at this stage. Walk the curve and verify every clamp can apply pressure perpendicular to the rail face (not at an angle). Mark caul positions in pencil so they go back exactly.

4

Check the cross-section transition.

Where the bending rail will join the straight rail, hold a sample of the straight rail (same family) up to the bending rail end. Cross-sections must match — same height, same width, same profile curvature. If they don't, you have either the wrong family or a sanded-down face. Recut the joint, plane to match, or order the right family.

5

Disassemble in reverse order.

Release clamps one at a time from the ends toward the middle (reverse of the install order). Lift the rail away clean. Mark the clamping order on the cauls or the back of the rail so you re-install in the same sequence when glue is on.

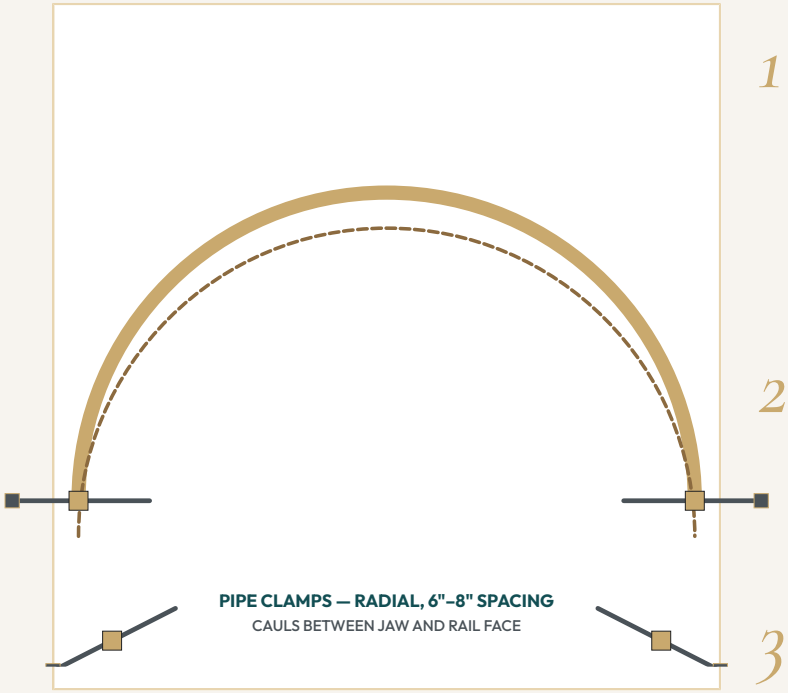
WHEN DRY-FIT FAILS

A dry-fit that fights you, kinks at a single point, or leaves a visible flat between kerfs is telling you the rail will not take this curve. Do not glue it anyway. Switch to a sub-rail method (page 10), kerf the rail further with a hand saw (last resort — voids the manufacturer's factory kerf pattern), or order the curve laminated from the UWP shop.

OPEN TIME IS THE CONSTRAINT

Glue, bend, *clamp.*

Two people, ideally three for anything longer than 4 feet. Glue applied to every kerf face (both sides) plus the kerf top. Rail bent into the curve. Clamps tightened in sequence from one end to the other, then incrementally cinched. Cure 24 hours minimum before unclamping.



RADIAL CLAMP PATTERN — 6"–8" SPACING

1

Glue every kerf.

Stand the rail flat on the bench, kerfs up. Apply slow-set PVA into every kerf with a thin nozzle bottle. Don't skimp — kerfs that close on a dry interface will fail at the joint. Coat the kerf top face (the underside of the rail above the kerf) lightly. 30 minutes of working time starts now.

2

Bend into the curve.

Two people: one at each end of the rail. Lift the rail onto the curve, kerfs facing in (concave). Walk it into position so the start mark lands on the start mark on the curve. Press the midpoint into place.

3

Clamp from the ends in.

Set the first clamp at one end of the curve, light pressure. Second clamp at the opposite end, same pressure. Walk inward from both ends, setting clamps one at a time at 6"–8" spacing. Cauls under every jaw. Final clamp at the midpoint.

4

Tighten in sequence.

With all clamps lightly set, walk the curve and incrementally tighten each clamp. Two passes minimum — first pass to firm pressure, second pass to full. Watch for glue squeeze-out at every kerf — that tells you the kerf is closing fully. No squeeze-out = no glue contact = future failure.

5

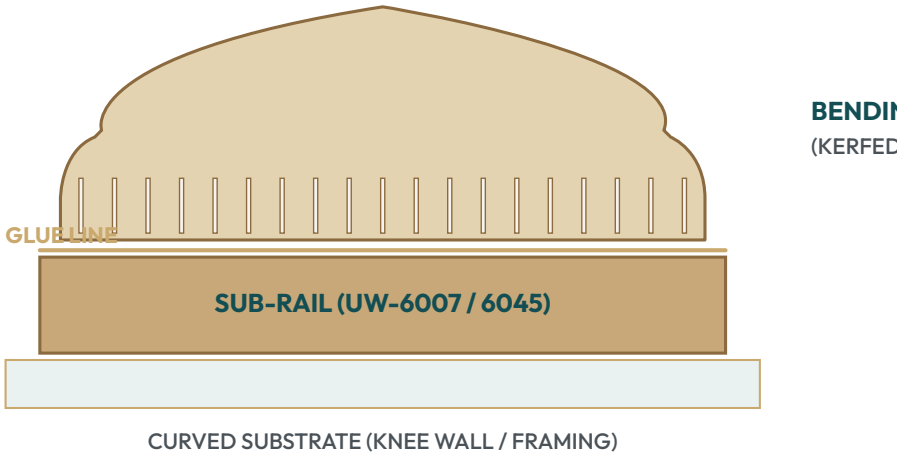
Clean and cure.

Wipe glue squeeze-out with a damp rag while still wet — set glue is much harder to remove. Once clean, leave undisturbed for a minimum of 24 hours (longer for low temperature or high humidity). Do not test the cure by flexing — wait. After 24 hr, release clamps in reverse order (midpoint last, ends first).

TWO LAYERS, MORE CONTROL

Sub-rail + *bending rail.*

On a Tier-2 or Tier-3 curve, the sub-rail does the structural bending and screws to the substrate; the bending handrail laminates to the sub-rail as a finish skin. The sub-rail bends in one direction; the bending rail bends in the same direction. Together they hold the curve under load without spring-back.



SUB-RAIL CROSS-SECTION · BENDING RAIL LAMINATED ON TOP OF SUB-RAIL

1 *Install the sub-rail.*

Use UW-6007 (most common) or UW-6045 if the rail is plowed for square balusters. The sub-rail is itself a kerfed bending stock — flex it to the curve, hold dry first to verify fit. Screw to the substrate (curved knee wall, curved framing, or curved template) with 1-1/4" finish screws every 8". Counter-bore the screw heads for later concealment.

2 *Verify sub-rail geometry.*

Once the sub-rail is fastened, check that the top surface tracks the desired handrail line at the right plumb height. The bending rail will follow this surface exactly — adjust here before laminating the top rail.

3 *Apply glue to sub-rail top.*

Spread slow-set PVA evenly across the entire top surface of the sub-rail. Generous bead — the bending rail will press it into a thin uniform layer when clamped. Avoid puddling in the middle.

Glue and bend the top rail.

4

Follow the same kerf-glue sequence as page 9 — glue every kerf, walk the rail onto the curve, clamp from the ends inward. The sub-rail acts as the curved surface; the bending rail follows it.

5

Cure, plug, finish.

Cure 24 hr. Release clamps. Plug the sub-rail screw counter-bores with matching species. Sand the joint between sub-rail and bending rail with 220 grit — they should read as a single profile. Touch-up putty as needed.

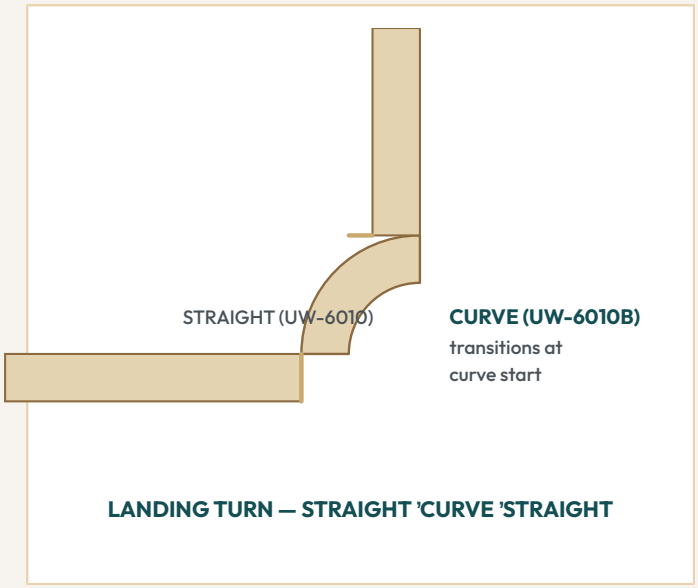
WHY THE SUB-RAIL WINS ON TIER 2

A single bending rail in a Tier-2 curve will spring-back 5–10% on release — the curve opens up. The sub-rail eliminates spring-back by holding the curve mechanically against the substrate. The bending rail laminated on top has nowhere to spring to. The visible profile stays exactly where you put it.

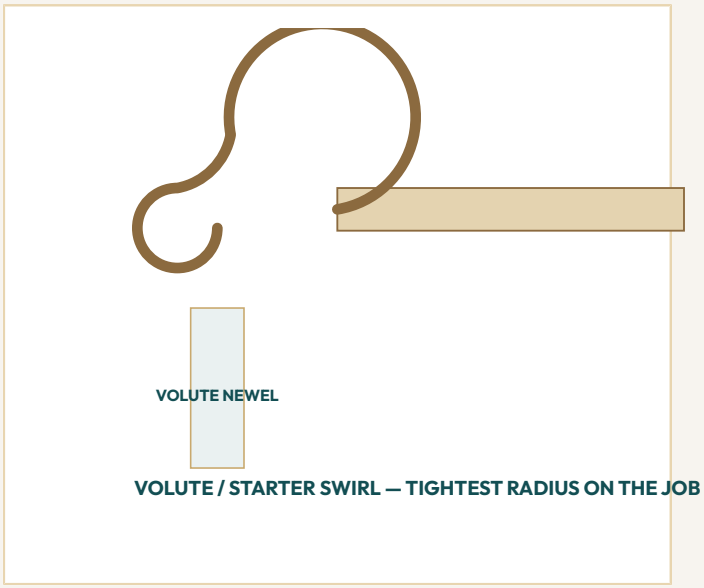
MOST CURVE JOBS ARE NOT CURVED STAIRS

Landing turns *and volutes.*

A continuous-radius curved stair is one application. Most curve jobs are smaller — a landing where the rail turns 90°, a volute at the bottom of a straight flight, or a curved starter step. Same product, same method, smaller scale. The radius is usually tighter on these (Tier 2–3) so plan on sub-rail + careful glue-up.



LANDING TURN · 90° RAIL ROTATION



VOLUTE · TIGHT SPIRAL AT STARTER STEP

1

Landing turn layout.

A 90° landing turn typically has a radius of 8"–12" measured at the rail centerline. Always Tier 3 — install a sub-rail (UW-6007 or 6045) following the inside corner of the landing. Glue the bending rail over the sub-rail in a single clamping pass. The transitions to straight rail on both ends use rail bolts.

2

Volute layout.

A volute (starter swirl) is the most demanding curve on a typical job — radius often under 6". Site-bending is rarely the right method here. Two options: (1) the volute is supplied as a pre-shaped fitting from the manufacturer matched to the rail family; (2) UWP's shop laminates the volute from the same species to template. The bending rail in the rake-section above the volute joins the volute fitting with a rail-bolt.

3

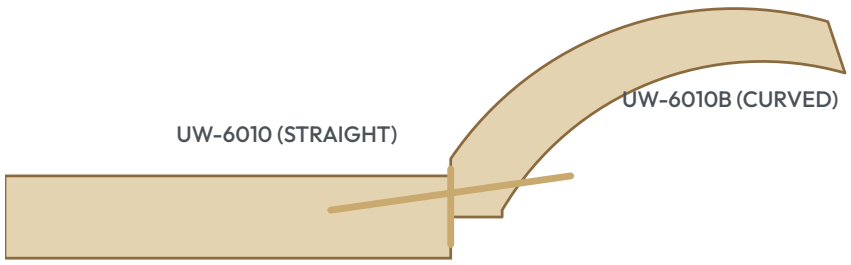
Curved starter step.

A curved starter step (round bullnose at the bottom riser) often has the rail following the same curve at handrail height. Typical radius 12"–20" — Tier 2 with sub-rail. The starting newel sits at the end of the bullnose; the bending rail terminates into the newel face.

THE TRANSITION THAT HAS TO DISAPPEAR

Curved meets *straight.*

On any stair with both straight and curved rail, there's a transition joint where the bending rail meets a straight handrail. Done right, it's invisible from above — same profile family, same species, same finish, joined with a rail bolt the same way two straight sections would meet. The trick is the cut: the bending rail must be cut perpendicular to the rail axis at the exact point the curve starts.



RAIL BOLT — same as straight runs
(page 12 of Handrail & Newel guide)

TRANSITION JOINT — STRAIGHT 'CURVED

TRANSITION JOINT · RAIL-BOLT JOINS STRAIGHT 6010 TO CURVED 6010B

1 *Mark the cut point.*

On the bending rail (after cure), mark exactly where the curve begins — the tangent point where the rail goes from straight to curved. This is the joint location. Mark on the straight rail the corresponding length needed to reach this point from the next newel.

2 *Cut both rails perpendicular.*

Both rails must be cut perpendicular to their respective rail axes — the straight rail cut at 90° to its length, the curved rail cut at 90° to the tangent at the cut point. On the curved rail this means using a pitch block matched to the tangent angle. The cuts should meet flat.

3 *Drill the rail-bolt pilot.*

Center the rail-bolt hole on the joining faces. On a curved rail, the centerline at the joint may be slightly offset from the tangent — measure and drill from the rail centerline, not the axis. Otherwise the bolt comes through the side.

4 *Dry-fit, glue, torque.*

Standard rail-bolt sequence: thread the stud into the straight rail tee-nut, slide the curved rail onto the stud, glue both faces, work nut and washer through the access mortise, torque. Clean glue squeeze before set.

5 *Blend the joint visually.*

Sand the joint with 180 then 220 grit, light strokes along the rail axis on both sides simultaneously. The joint becomes invisible. Test by running a finger across the seam with eyes closed — if you feel a step, sand more.

THE CURVE IS WHAT PEOPLE WILL TOUCH

Finishing *the curve.*

A curved rail draws the hand. Every joint, every kerf line, every glue residue is going to be felt by every user. Finishing the curve takes more time than finishing a straight rail of the same length — every section has its own grain orientation, and curved surfaces don't sand straight. The good news: the most demanding part is the underside, which most people won't see.

TOP FACE (VISIBLE, HAND-TOUCHED)

No kerfs on the top — it's a continuous solid face. Sand with a sanding sponge that conforms to the curvature, 120 ’180 ’220 along the rail axis (never across).

For high-touch stain runs, finish with 320 grit and a clear wax. The hand-feel difference is the difference between a shop rail and a contractor rail.

UNDERSIDE (THE KERFED FACE)

After cure, the kerfs are closed glue lines. Scrape excess glue with a sharp chisel held at a high angle (40°+) along the rail axis. Sand 80 ’120 ’180 to blend the glue lines into the wood.

Glue lines that telegraph through stain are the most common failure mode — heavy stain in those areas, blot to even out.

1

Wait full cure.

Do not start finishing until 48 hours after clamp release on PVA, 72 hours on PU. Glue continues to cure for days; stain applied to partially cured glue lines will not match the surrounding wood.

2

Scrape and sand the underside.

Scrape glue residue with a sharp chisel. Sand the underside 80 ’120 ’180 with a sponge that follows the curve. Dust off, wipe with mineral spirits to check for residual glue (it appears as a lighter spot under spirits).

3

Sand the top.

Sand the top face 120 ’180 ’220 along the rail axis. The crown of the rail wants a curved sanding tool — a rubber block with a slight relief, or a sanding sponge. Avoid sanding the rail edges flat — keep the original profile.

4

Stain.

On red oak, white oak, or maple bending rail, test stain on a kerf-line scrap before committing. End grain (at the rail joints) takes stain heavier than face grain — pre-condition end grain or wipe stain off the joints faster than the rest of the rail.

5

Topcoat and wax.

2–3 coats of polyurethane (sanded between with 320). Allow full cure (24 hr) before traffic. For premium runs, finish with paste wax over the cured topcoat — buff with a soft cloth. The wax fills any remaining kerf-line micro-texture.

WHEN SITE-BENDING WILL NOT TAKE IT

Order it *laminated.*

Where the radius is tighter than R = 12", where the curve is compound (changes direction along its length), or where the species is too brittle to bend (think hard maple, ipé, exotic hardwoods), site-bending stops being a method. The UWP shop laminates the curve from multiple thin plies (each ply individually flexible) glued and clamped to a curved form. The result is a finished arc delivered to the jobsite, ready to mount.

WHEN TO CALL THE SHOP

- Radius under 12" at handrail height
- Compound or helical curves (3D bending)
- Species too brittle for site-bending — hard maple, ipé, walnut over 6" radius
- Show stair where the rail must be visually perfect at first sight
- Site conditions (cold, dry, dusty) hostile to glue cure
- Schedule does not allow 24-hr cure on-site

HOW TO SCOPE THE QUOTE

- Provide chord + sagitta from the story stick (page 7)
- Note the rail profile family (6010 / 6210 / 6710 / 6003)
- Specify species and finish — stain match or paint grade
- Note transitions — straight rail at each end (rail-bolt joint) or terminating at newel
- Note plumb-cut angle at each end (tangent to the curve at the transition)
- Lead time 2–4 weeks depending on shop load and species availability

THE SHOP PROCESS — FOR REFERENCE

UWP's shop process: build a curved form from MDF or plywood at the target radius. Resaw the chosen species into thin plies (typically 1/8"). Apply slow-set wood glue between every ply. Stack the plies on the form and clamp uniformly along the length. Cure 24–48 hours. Plane the dry laminated blank to the target rail profile on a shaper. Sand, deliver to site. The installer mounts the finished curve like a straight rail.

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THINGS THAT GO WRONG ON REAL JOBS

Field *troubleshooting.*

Rail kinks at one point.
Kerfs in that section did not close uniformly. Caused by a clamp set too tight too fast, or a hidden defect in the rail (knot at the kerf). Release immediately, scrape glue, fill with epoxy, re-clamp at lighter pressure. If wet glue is past open time, recut the rail.

Spring-back after clamp release.
Rail opens up to a larger radius than the form. Caused by under-cured glue, insufficient clamp pressure, or a Tier-1 rail attempted on a Tier-2+ curve. Re-clamp dry to the original radius, leave 48 hr to relieve. For future jobs: use sub-rail method on Tier-2 curves.

Visible kerf lines after stain.
Glue squeezed into the kerf top face and rejected stain. Or kerfs did not fully close (gap). For closed-kerf telegraph: blot stain heavily into the kerf line area; the wood will catch up. For open-kerf gaps: pre-fill with matching wood filler before stain.

Joint between curved and straight is visible.
Cross-sections do not match — either different profile families ordered, or the curved rail was sanded thinner on top by aggressive shaping. Sand the straight rail to match (small amount only), or order replacement curved rail in the correct family.

Rail cracks at a kerf during bending.
You forced a Tier-3 radius with a standard kerf-pattern rail. Damage cannot be repaired structurally — the rail will fail under code load. Replace the rail and switch to sub-rail method or order shop-laminated.

Glue squeeze does not appear at every kerf.
Some kerfs did not get glue. If caught during open time, run more glue and re-clamp the dry sections. If past open time, structural integrity is compromised — pull the rail, recut.

Sub-rail fights the curve.
Sub-rail stock is too stiff for the radius. Sub-rail comes in standard (UW-6007) and deep / pre-kerfed (UW-6050 / UW-6001SP3) variants. For tight radii, order the pre-kerfed sub-rail rather than fighting the standard.

Rail length is short after bending.
Bending consumed more length than expected (3–8% in kerf closure on tighter radii). Cannot stretch the rail; can scarf-join a new section. Cut a 6" scarf at the short end, bond with matching species and slow-set glue, sand to blend.

Rail height fails on the curve.
IRC R311.7.8.1 — 34"–38" plumb above the nosing — applies on the curve same as straight. If short, you cannot move the cured rail; remove and reset higher with new newel anchors. Better to verify on the dry-fit (page 8) than after cure.

CURVE DOES NOT CHANGE CODE

Final *inspection.*

A curved handrail meets the same IRC code as a straight one — there is no exemption for curves. Height is still 34"–38" plumb above the nosing; graspability is still Type I or Type II; continuity is still end-to-end of the flight; returns at the wall side still apply. The checklist below mirrors the straight-rail sign-off with the curve-specific adds.

IRC COMPLIANCE

- Handrail height 34"–38" plumb above nosing along the full curve and the straight sections (R311.7.8.1)
- Handrail continuous from top to bottom riser line, no breaks at the curve transition (R311.7.8.2)
- Handrail grasp meets Type I or Type II at every point along the curve (R311.7.8.3)
- Handrail terminates in newel or returns to wall via rosette (R311.7.8.4)
- 1-1/2" minimum clearance between handrail and wall, including along the curve
- Stair guard ≥ 36" measured from tread nosing (R312.1.2)
- 4" sphere cannot pass between curve balusters — radial geometry tightens spacing on the inside of a curve, check at the tightest point
- Newel anchors at curve termination resist 200-lb concentrated load (R301.5)

CURVE-SPECIFIC QUALITY

- Bending rail kerfs all closed and glue lines fully cured (24 hr+)
- Sub-rail (if used) fully fastened to substrate at ≤ 8" spacing
- Glue squeeze visible at every kerf during clamp-up (verified before clean-off)
- No visible kink, flat, or out-of-curve point along the radius
- Transition joint to straight rail flush — no step felt by hand
- All rail-bolt access mortises plugged with matching species
- Underside scraped of glue residue, sanded to blend with face
- Top face sanded along axis, no cross-grain marks
- Stain or finish color matches straight sections within hand-eye tolerance

BALUSTER SPACING ON A CURVE — CAREFUL HERE

On a curved guard, balusters are radial — closer together on the inside of the curve, farther apart on the outside. The 4" sphere rule applies at every point. Measure at the inside of the curve, where spacing is tightest. If you laid out balusters even-on-the-outside, you may have a code failure on the inside. Re-divide if needed.

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